Claims

1. A caliper pig for detecting an obstruction in a pipeline, having an elongated body including a front end and a rear end and comprising a front carrying guide ring at said front and a rear carrying guide ring at said rear end, said carrying guide rings being adapted for supporting the body in a coaxial sliding engagement with the interior of the pipeline and driving the body through the pipeline, the front end first, using the flow of fluid in the pipeline, said body further carrying a coaxial, generally disc-shaped, resiliently flexible detector operatively associated with transfer mechanism including a converting member movable relative to the body responsive to a generally axial force to transmit a mechanical impulse developed at the detector to activate and to deactivate an electrical signal producing device secured to said body, said detector having an outer diameter smaller than the inside diameter of the pipeline to define therewith a generally annular void having a predetermined radial clearance; said transfer mechanism being operatively disposed between a flexing portion of the detector and said converting member to transmit changes in the form of the deflector to said axial force, the converting member being disposed between said carrying rings and being located closer to the rear carrying guide ring than to the front carrying guide ring.

2. A caliper pig for detecting an obstruction in a pipeline, having an elongated body including a front end and a rear end and comprising carrying guide rings at said front and rear ends for supporting the body in a coaxial sliding engagement with the interior of the pipeline and driving the body through the pipeline, the front end first, using the flow of fluid in the pipeline, said body further carrying a coaxial, generally disc-shaped, detector operatively associated with transfer mechanism including a converting member movable relative to the body responsive to a generally axial force to transmit a mechanical impulse developed at the detector to activate and to deactivate an electrical signal producing device secured to said body, wherein

(i) said detector has an outer diameter smaller than the inside diameter of the pipeline to define therewith a generally annular void having a predetermined radial clearance;

(ii) said transfer mechanism is operatively disposed between a flexing portion of the detector and said converting member to transmit changes in the form of the deflector to said axial force; and

(iii) the converting member is a sleeve axially movably secured to and coaxial with said body.

3. The caliper pig of claim 2, wherein the detector is a resiliently flexible, segmented disc-shaped member fixedly secured to the body and comprising a plurality of segments separated from each other by generally radial separation lines.

4. The caliper pig of claim 3, wherein the transfer mechanism includes a series of links pivotably connected, at one end thereof, with said segments and, at the other end, with said sleeve, whereby resilient flexing of one or more of said segments is transmitted to said sleeve as said generally axial force.

5. The caliper pig of claim 4, wherein said sleeve is axially movable along the body and carries switch actuation means.

6. The caliper pig of claim 1, wherein the detector is a resilient disc having a smaller diameter than the inside diameter of the pipeline.

6. The caliper pig of claim 2 wherein the converting member includes a sleeve movably secured to and coaxial with the body, said resilient disc being generally fixedly secured to said sleeve.

7. The caliper pig of claim 6, wherein said detector is a resilient disc having a scratch recording layer bonded to a front face thereof turned toward said front end of the pig said layer possessing:

(a) flexibility sufficient for the layer to follow resilient deformation of the resilient disc and return with the disc to a non-deformed state;

(b) smoothness and softness sufficient for the layer to become and remain scratched when the detector engages an anomaly of a predetermined minimum radial magnitude and when the detector returns to said non-deformed state;

whereby, after passage of the caliper pig through the pipeline, the front face of the disc indicates the nature and magnitude of anomaly or anomalies encountered during the passage by way of scratched portions of the recording layer.

8. The caliper pig of claim 7, wherein said detector is a disc made from an elastomeric material and said scratch recording layer is a lead plate bonded to said front face of the disc.

9. The caliper pig of claim 8, wherein the outside diameter of the detector is about 80% of the inner diameter of the pipeline.

10. The caliper pig of claim 9, wherein the thickness of said lead plate is from about 1/16" to about 1/8", the thickness of said disc being from about 2" to about 12".

11. The caliper pig of claim 10, wherein the outside diameter of the disc and of the layer is about 8", the thickness of the lead plat is about 1/16" and the thickness of the disc is about 3/4".

12. The caliper pig of claim 7, wherein said resilient disc is a urethane disc and said scratch recording layer is a layer of paint.

13. For use in a pipeline caliper pig including a body provided with support and drive members for sliding engagement with the interior of the pipeline to drive the body coaxially through the pipeline by the flow of fluid in the pipeline:
an elastomeric, generally disc-shaped detector compatible with said body for securement thereto, said detector comprising;

(a) a first face, an axially opposed second face, and a circular circumferential edge portion having a predetermined diameter smaller than the inside diameter of the pipeline;

(b) said first face having a forward surface possessing:

(i) resiliency sufficient to follow resilient deformations of the ring and to return, with the ring, from a deformed to a non-deformed state;

(ii) smoothness and softness sufficient to become and remain scratched by obstacles in the pipeline as the detector, secured to said body, advances through the pipeline;

(iii) said forward surface being a surface of a lead plate bonded to said first face.

14. The detector of claim 13 wherein the thickness of said lead plate is about 1/16", the thickness of the elastomeric ring being about 3/4".

15. The detector of claim 13, wherein the thickness of said lead plate is from about 1/16" to about 1/8".

16. The detector of claim 13, wherein the thickness of the elastomeric ring is from about 2" to about 12".

17. For use in a pipeline caliper pig including a body provided with support and drive members for sliding engagement with the interior of the pipeline to drive the body coaxially through the pipeline by the flow of fluid in the pipeline:
an elastomeric, generally disc-shaped detector compatible with said body for securement thereto, said detector comprising;
(a) a first face, an axially opposed second face, and a circular circumferential edge portion having a predetermined diameter smaller than the inside diameter of the pipeline;
(b) said first face having a forward surface possessing:
(i) resiliency sufficient to follow resilient deformations of the ring and to return, with the ring, from a deformed to a non-deformed state;
(ii) smoothness and softness sufficient to become and remain scratched by obstacles in the pipeline as the detector, secured to said body, advances through the pipeline;
(iii) said forward surface being the surface of a layer of paint bonded to the front face of the disc.

18. A caliper pig for detecting an obstruction in a pipeline, comprising:
(a) an elongated body having an axis of elongation, including a front end and a rear end and having carrying guide rings at said front and rear ends for supporting the body in a coaxial sliding engagement with the interior of the pipeline and for driving the body through the pipeline, the front end first, using the flow of fluid in the pipeline,
(b) said body supporting a coaxial, generally disc-shaped resiliently deformable detector having a plurality segments disposed about the periphery of the detector, each segment having a predetermined arc and length of its chord;
(c) a plurality of transmission devices each associated with one of said segments for transmitting a generally axial deformation of a radially outer portion of said segment to an electrical signal activating device;
(d) said detector being mounted for free rotation relative to the body about an axis coincident with said axis of elongation;
(e) a ballast operatively associated with said detector to maintain each of said segments in generally the same position relative to a vertical reference plane coincident with said axis of elongation;
(f) said detector having an outer diameter smaller than the inside diameter of the pipeline to define therewith a generally annular void having a predetermined radial clearance.

19. The caliper pig of claim 18 wherein the detector is fixedly secured to a mandrel, said mandrel being mounted on said body for rotation about said axis of elongation and being axially fixed relative to the body.

20. The caliper pig of claim 19 wherein the ballast is a chamber fixedly secured to the mandrel at a lowermost outer portion thereof.

21. The caliper pig of claim 18 wherein each said transmission device comprises:

(a) a first transmission member;

(b) a second transmission member ;

(c) the first transmission member including a first support portion carrying a permanent magnet;

(d) the second transmission member including second support portion carrying a magnetic switch connected to a recording device;

(e) one of said first and second transmission members being secured to the detector to displace its support portion toward the support portion of the other transmission member in dependence of the degree of said axial deformation of the respective segment.

22. The caliper pig of claim 21 wherein

(a) the first transmission member is a generally L-shaped spring having a first arm, a second arm and a pivot at a point of intersection of the first and second arms;

(b) the pivot having a pivot axis generally perpendicular to a reference plane defined by the first and second arm;

(c) the first arm being secured to the detector with a free end of the first arm parallel with one face of the detector; and

(d) the second arm projecting at an angle to the face of said one face of the detector and having at its free end one of said first or second support portions;

(e) the second transmission member is fixedly secured relative to the mandrel at a location axially remote from the detector.

23. The caliper pig of claim 22, wherein

(a) the second support portion carries a permanent magnet;

(b) the second transmission member is an annular spacer carrying a magnetic switch connected with a recording system.